

Report

Study of STALO Amplitude on NEXRAD Performance

Bill Urell, ROC Engineering
(405)366-6520 X4283

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1. SCOPE

This report describes the tests performed on the KCRI NEXRAD system to evaluate the sensitivity of the system calibration, System Noise Temp (Noise Figure) and Dynamic Signal Handling Range. Of particular interest was the effect of reducing the amplitude of STALO by 3 dB as would be occasioned by the addition of a passive STALO power splitter in the ORDA design.

2. EXECUTIVE SUMMARY

The tests revealed absolutely no measurable effect on Mixer/Preamp Gain, System Noise Temp, NEXRAD Reflectivity Calibration or Dynamic Signal Handling Range out to additional 3.7dB attenuation of STALO as applied to the Mixer/Preamp. This is a very satisfying result as it means that a passive STALO power splitter with a nominal attenuation of 3 dB may be used in the ORDA design..

3. TEST DESCRIPTION

The KCRI system was run in the OPERATE mode and the data tabulated in Table 1 was collected for various amounts of attenuation of STALO as applied to the legacy Mixer/Preamp 4A5.J2.

Table 1 NEXRAD Data With Attenuated STALO

| Parameter | 0dB Atten (normal) | 3dB Atten added | 3.7dB Atten added | 6dB Atten added |
|--|-----------------------|-----------------|----------------------|-----------------|
| Cal # | -0.25dB | -0.16dB | -0.25dB | +1.89dB |
| Lin Chan SYSCAL | 10.1 | 10.4 | 10.2 | 12.4 |
| Lin Short Pulse Noise | 0.179E-05 | 0.170E-05 | 0.172E-05 | 0.135E-05 |
| System Noise Temp | 493K | 502K | 485K | 600K |
| CW Tst Tgt delta (Meas - Expect) | -.1 | -.1 | -.3 | 0 |
| RFD1 delta | +.7 | +.4 | +.7 | +.3 |
| RFD2 delta | 0 | +.2 | +.6 | +.2 |
| RFD3 delta | -.3 | -.6 | -.1 | -.6 |

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|--------------------------------|-------|-------|---------|---------|
| KCRI Dyn Range Mean Gain | 44.96 | 44.60 | 44.43 | 42.65 |
| KCRI Dyn Range 1dB Compress Pt | 8.24 | 7.83 | 7.68 | 5.74 |
| KCRI Input Dyn Range | 80.96 | 81.29 | 81.37 | 82.78 |
| KREX Input Dyn Range | 94.27 | 94.55 | No data | No data |
| Lin Clutter Suppression dB | 58.5 | 58.5 | 58.5 | 59.3 |

4. ANALYSIS OF RESULTS

An analytical synopsis of the results in Table 1 follows:

* The change in Mixer/Preamp 4A5 gain is reflected in the change in Lin Chan SYSCAL. Note that there is no change until STALO is attenuated 6dB. At this point, the Mixer/Preamp gain decreases by 2dB as reflected in the increase of SYSCAL by 2dB. Note that the primary function of SYSCAL is to compensate for gain changes in the Receiver shared path. The fact that the test target deltas remained small attests to the fact that the system worked beautifully at accomplishing this task. The Lin Chan Short Pulse Noise at 6dB also reflects this change in Mixer gain

* The System Noise Temp increase of 100K at 6dB means that the receiver Noise Figure is beginning to deteriorate. Noise Temp alarm would be initiated if the noise temp increases to 700K. This is the most sensitive of all of the receiver status alarms.

* The RDASOT Input Dynamic Range is 13dB less than it should be under all conditions of STALO amplitude. There is no ready explanation of this, therefore the Dyn Range test was repeated on KREX. The KREX results confirmed that the nominal Dyn Range spec of 93dB was met with normal STALO as well as 3dB of added attenuation.

* The Lin Chan Clutter Suppression results were excellent under all conditions of STALO amplitude.

W. J. Urell
William.j.urell@noaa.gov
(405)366-6520 X4283